# Chapter 10

# Upper Chattahoochee River Case Study

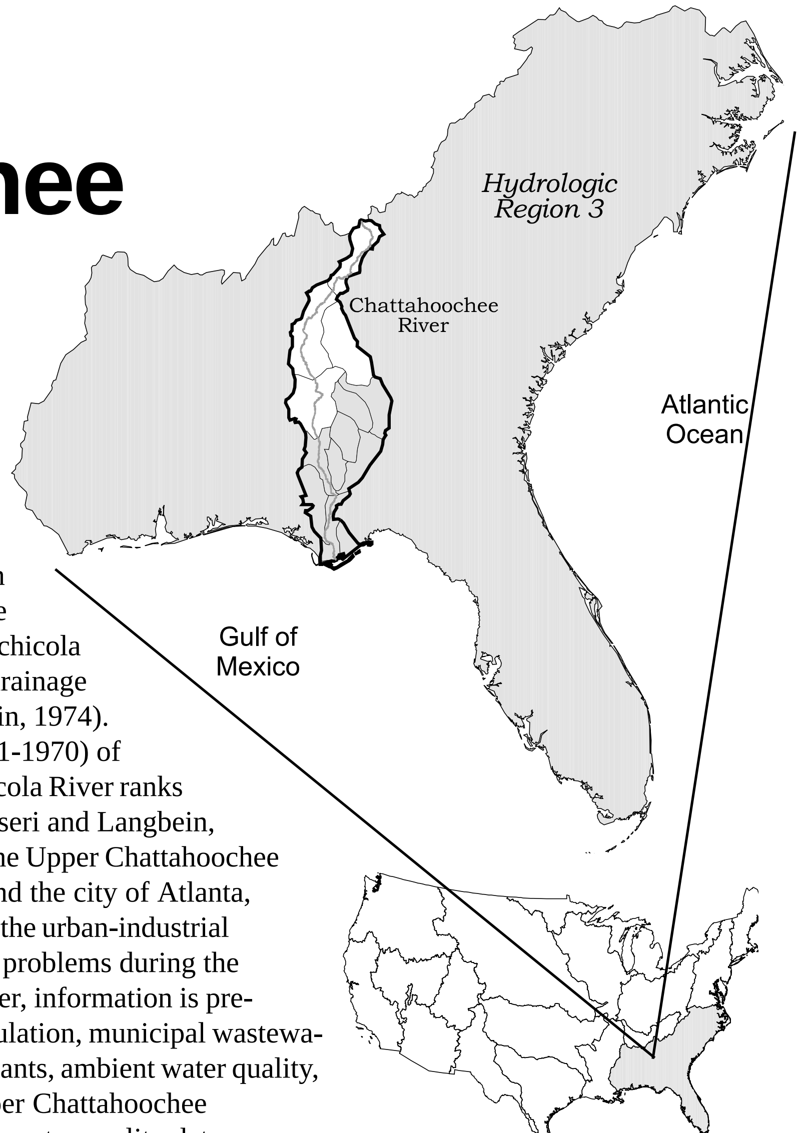



**Figure 10-1**

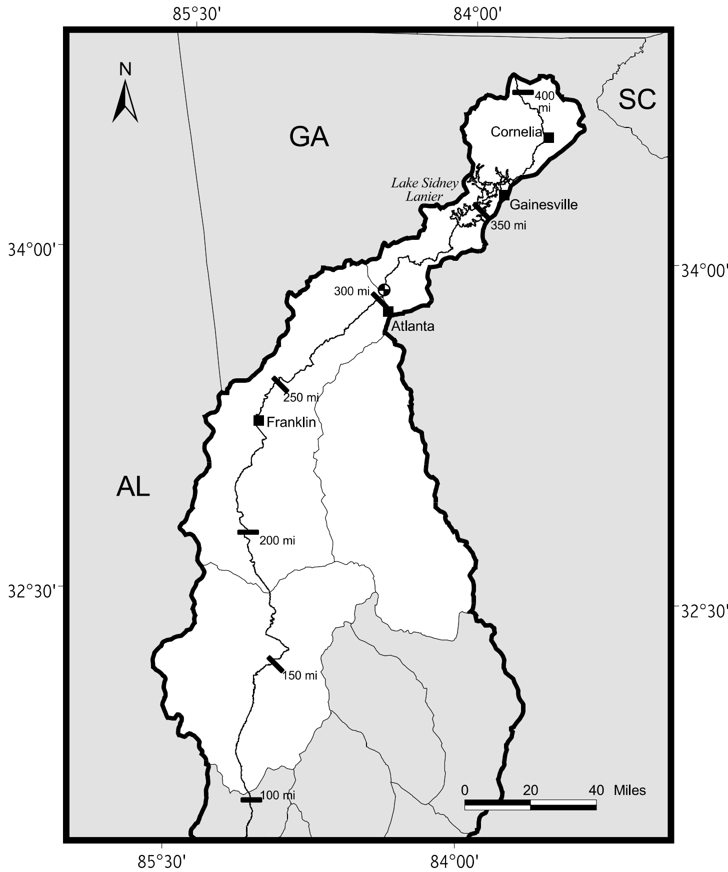
Hydrologic Region 3 and the Chattahoochee-Flint-Apalachicola River Basin.

The Southeast Basin (Hydrologic Region 3), covering a drainage area of 278,523 square miles, includes the Chattahoochee-Flint-Apalachicola River, which has a length of 524 miles and a drainage area of 19,600 square miles (Iseri and Langbein, 1974). On the basis of a mean annual discharge (1941-1970) of 24,700 cfs, the Chattahoochee-Flint-Apalachicola River ranks 23rd of the large rivers of the United States (Iseri and Langbein, 1974). Figure 10-1 highlights the location of the Upper Chattahoochee River case study watersheds (catalog units) and the city of Atlanta, Georgia, identified in this river basin as one of the urban-industrial waterways affected by severe water pollution problems during the 1950s and 1960s (see Table 4-2). In this chapter, information is presented to characterize long-term trends in population, municipal wastewater infrastructure and effluent loading of pollutants, ambient water quality, environmental resources, and uses of the Upper Chattahoochee River. Data sources include USEPA's national water quality database (STORET), published technical literature, and unpublished technical reports ("grey" literature) obtained from local agency sources.

The Chattahoochee River Basin constitutes almost 40 percent of the Chattahoochee-Flint-Apalachicola River Basin (Figure 10-2), which discharges into the Gulf of Mexico. The Chattahoochee River flows from northeast Georgia through metropolitan Atlanta to West Point Dam. From there the river forms the Georgia-Alabama border and, for a short distance, the Georgia-Florida border. Near the southern border of Georgia the Flint River joins the Chattahoochee River to form the Apalachicola River. Major urban centers in the

**Figure 10-2**

Location map of Upper Chattahoochee Basin. River miles shown are distances from Gulf of Mexico.




Upper Chattahoochee River Basin include Atlanta, Gainesville, Marietta, Cornelia, and Alpharetta, Georgia. The Atlanta region represents only 3.6 percent of Georgia's total land area but contains one-third of the state's population (ARC, 1984). The large volume of wastewater discharged in the Atlanta area has a far-reaching effect on water quality conditions in receiving waters. The Upper Chattahoochee River is by far the largest river in the Atlanta region. Other streams in the region include Sweetwater Creek, South River, Flint River, Yellow River, Peachtree Creek, and Line Creek.

The Chattahoochee River is Atlanta's major water supply source and receptacle for wastewater disposal. The Upper Chattahoochee River Basin provides numerous recreational areas and fish and wildlife habitats. Lake Sidney Lanier, for example, is a nationally popular water resort area. The area from Buford Dam to Peachtree Creek has been under intensive development pressures that threaten the water quality of the Chattahoochee River.

# Physical Setting and Hydrology

The Upper Chattahoochee River Basin covers 10,130 square miles from the southern slopes of the Blue Ridge mountains, in northeast Georgia, to the West Point Dam at the Georgia-Alabama state line. The flow length of this section is 250 river miles, generally to the southwest. The basin is narrow in relation to its length, the average width being less than 40 miles. Elevations in the Upper Chattahoochee

Basin range from approximately 4,000 feet at the headwaters to approximately 635 feet at West Point Lake. Air temperature tends to be cooler in the mountains and warmer in the southern areas of the basin; the annual air temperature averages about 16 $^{0}$C. Average annual rainfall in the basin is about 54 inches over the basin area of 3,440 square miles. The rainfall tends to be greatest in upland areas and in the southern region of the basin (Cherry et al., 1980; Lium et al., 1979).

Flow in the river is dependent on rainfall and regulation by the hydroelectric generating facilities at Buford Dam and Morgan Falls Dam. High-flow conditions usually occur in the spring and low-flow conditions in late autumn (Figure 10-3). The most pronounced changes in regulated flow have occurred as a result of the construction and operation of the Buford Dam since 1957. In the mid-1960s, the city of Atlanta and the Georgia Power Company modified the Morgan Falls Dam and Reservoir, just upstream of Atlanta, to provide a minimum flow of 750 cfs from Morgan Falls. Since 1965 minimum streamflows have been higher and more consistent as a result of those modifications (Figure 10-4). The average flow at

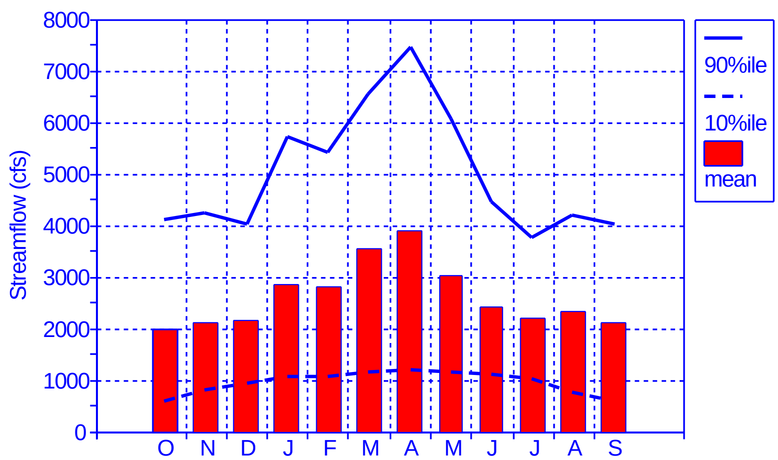



**Figure 10-3**

Monthly trends in streamflow for the Chattahoochee River. Monthly mean, 10th, and 90th percentile statistics computed for 1951-1980 (USGS Gage #02336000 at Atlanta, Georgia).

*Source: USGS, 1999.*

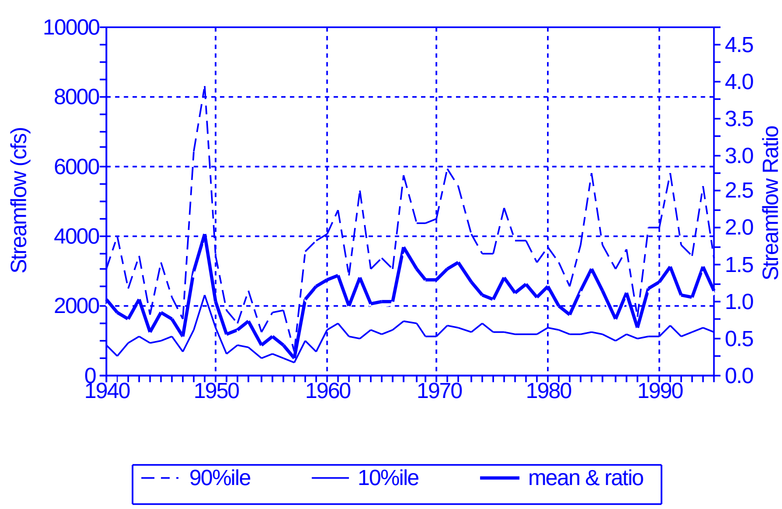



**Figure 10-4**

Long-term trends in mean, 10th, and 90th percentile statistics computed for summer (July-Septem-ber) streamflow for the Chattahoochee River (USGS Gage #02336000 at Atlanta, Georgia).

*Source: USGS, 1999.*

**Table 10-1.** Metropolitan Statistical Area (MSA) counties in the Upper Chattahoochee Basin case study. *Source: OMB, 1999.*

| | |
|---|---|
| Barrow | Forsyth |
| Bartow | Fulton |
| Carroll | Gwinnett |
| Cherokee | Henry |
| Clayton | Newton |
| Cobb | Paulding |
| Coweta | Pickens |
| DeKalb | Rockdale |
| Douglas | Spalding |
| Fayette | Walton |

Buford Dam, based on 35 years of record, is 2,168 cfs. The average flow near Atlanta, based on 43 years of record, is 2,603 cfs. Regulations for minimum streamflow volumes set in 1974 require a minimum release of 1,100 cfs from Morgan Falls, further increasing minimum streamflows near Atlanta (Cherry et al., 1980; Lium et al., 1979).

# Population, Water, and Land Use Trends

The Upper Chattahoochee River case study area includes several counties that are defined by the Office of Management and Budget as Metropolitan Statistical Areas (MSAs) or Primary Metropolitan Statistical Areas (PMSAs). Table 10-1 lists the MSA and counties included in this case study. Figure 10-5 presents long-term population trends (1940-1996) for the counties listed in Table 10-1.

From 1940 to 1996 the population in the Upper Chattahoochee River case study area increased dramatically (rising from 0.41 million in 1940 to 3.53 million in 1996). The U.S. Bureau of the Census reported the 1970 population of the

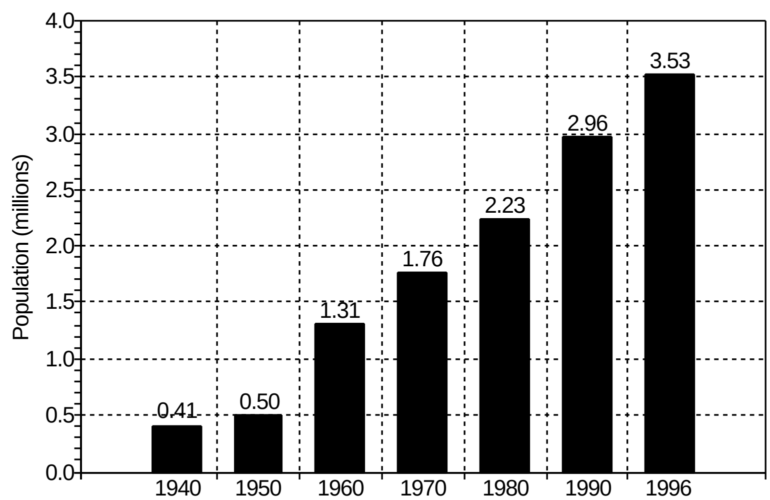



**Figure 10-5**

Long-term trends in population in the Upper Chattahoochee River basin.

*Sources: Forstall, 1995; USDOC, 1998.*

Atlanta area to be 1.7 million. By 1990 this number had risen to 2.95 million (Forstall, 1995; USDOC, 1998). During the 1950s through the 1970s, population in the Atlanta region increased by 34 percent to 39 percent; the greatest growth rates were recorded in 1950-1960 (39 percent) and 1970-1980 (38 percent). During the 1980s and 1990s, the rate of growth slowed down considerably: the population increased by 22 percent from 1980 to 1990 and by only 19 percent from 1990 to 1996 (Forstall, 1995; USDOC, 1998). During the 1970s, population density in the area varied by about an order of magnitude from approximately 40 persons per square mile in the rural, headwater areas of the basin to 492 persons per square mile in the urban environs of Atlanta (Faye et al., 1980).

Land in the Upper Chattahoochee Basin, upstream and downstream of Atlanta, is predominantly forest. The Atlanta area of the basin is predominantly residential. Agricultural activity is fairly evenly distributed through the basin. Table 10-2 shows the major land uses in the basin (Cherry et al., 1980; Lium et al., 1979; Stamer et al., 1979). Agricultural activities above the Buford Dam are concentrated in stream valleys and on the lower slopes. Crops and pastures occupy a significant portion of the agricultural areas, but poultry operations are the economically dominant agricultural activity. Urban areas are predominantly residential, but industrial activities are significant. Industrial activities include automobile assembly, food processing, and light manufacturing. Intense industrial land use dominates the area downstream of Interstate Highway 75 (Mauldin and McCollum, 1992).

Power generation, water supply, water-quality maintenance, and recreation are activities currently supported along the Chattahoochee River. Six power-generating facilities use the resources of the Chattahoochee River. The Buford Dam and Morgan Falls Dam are peak-power hydroelectric generating facilities. The other four are fossil-fuel thermoelectric power plants. The six plants have a combined generating capacity of approximately 3.8 million kilowatts. Two fossil-fuel plants near Atlanta discharge nearly 1000 cfs of cooling water to the river.

As of 1998, 29 public water treatment plants process water withdrawn from rivers and lakes in the Atlanta region and 3 new treatment facilities were proposed for the Atlanta area. The largest water treatment plants in the region are operated by the city of Atlanta (Hemphill & Chattahoochee, design capacity 201 mgd), Dekalb County (Scott Candler, 128 mgd), Gwinnett County (Lake Lanier, 120 mgd), and Atlanta-Fulton County (Atlanta-Fulton County, 90 mgd). The Chattahoochee River and Lake Lanier are their main sources of raw water. The total capacity of

**Table 10-2**. Land use in the Upper Chattahoochee River Basin.

| Location | Area *($mi^2$)* | \|-------Percentage Breakdown-------\| Urban | Agriculture | Forest |
|---|---|---|---|---|
| Above Buford Dam | 1,040 | 4 | 16 | 81 |
| Buford Dam - Atlanta | 410 | 22 | 18 | 60 |
| Atlanta - Fairburn | 610 | 40 | 12 | 49 |
| Fairburn - Whitesburg | 370 | 6 | 17 | 77 |
| Whitesburg - West Point Dam | 1010 | 4 | 17 | 79 |

the public water supply withdrawals from the 14 largest water treatment plants is 770.5 mgd (ARC, 1998). As of the late 1990s, approximately 443 mgd was withdrawn from water sources in the Upper Chattahoochee, primarily from surface water sources (ARC, 1998). During the mid-1970s, water use was estimated at 180 mgd with an increase in demand to 484 mgd fairly accurately projected for the year 2000 (Lium et al., 1979). Providing about 85 percent of the region's water supply, the Chattahoochee River and Lake Lanier system and the Etowah River and Allatoona Lake system are the most important sources of public water. As of the late 1990s, residential and commercial water uses accounted for 54 percent and 23 percent of the total water demand, respectively. Government activities accounted for 6 percent and manufacturing uses for only 4 percent; approximately 14 percent could not be accounted for (Kundell and DeMeo, 1999). By the year 2020, regional water demand is expected to increase by approximately 46 percent of the withdrawals ca. 1998. The projected increase in water demand and the limited availability of surface water and ground water supply sources in northern Georgia are a key factor in the need for regional cooperation to meet the challenges posed by water supply and water quality problems in the Atlanta region (Kundell and DeMeo, 1999).

Water-based recreational activities are abundant all along the Chattahoochee River. The headwaters are popular for trout fishing, camping, and hunting. Lake Sidney Lanier maintains numerous boat launches, campgrounds, marinas, yacht clubs, and cottages. The reach from Buford Dam to Atlanta supports fishing, canoeing, and rafting. The reach between Morgan Falls and Peachtree Creek, one of the most scenic on the river, is the site for an annual raft race that draws thousands of participants and onlookers to the area. West Point Lake, at the base of the Upper Chattahoochee River Basin, is an impoundment created by the construction of West Point Dam in 1974. This lake is widely used for fishing, boating, camping, and swimming.

# Historical Water Quality Issues

The poet Sidney Lanier, who praised the Chattahoochee in his "Song of the Chattahoochee," would not have been so inspired during the 1940s, 1950s, and 1960s. The Chattahoochee River was characterized by poor water quality for a reach of 70 miles below Atlanta. The first 40 miles were described as "grossly polluted," and responsibility was attributed to inadequately treated wastewater, particularly from Atlanta's R.M. Clayton sewage treatment plant, at the mouth of Peachtree Creek (EPD, 1981). Figure 10-6 shows the effect Atlanta's wastewater discharges historically have had on the water quality of the Chattahoochee River, with DO levels drastically depleted downstream of Atlanta near SR-92 (RM 280). At Fairburn, an average of 13 percent of the river flow consisted of wastewater (Stamer et al., 1979). From July through October heat and low flow placed the river in near septic conditions, with DO below 4 mg/L 64 percent of the time. During the period from 1968 to 1974, DO concentrations were 64 percent less in the summer months than in January and minimum DO levels were consistently below 1 mg/L (EPD, 1981). In 1973 DO concentrations dropped to zero during September. As of 1972 the R.M. Clayton plant was still releasing large quantities of wastewater receiving only primary treatment. Fecal coliform densities, ammonia, $BOD_5$, and

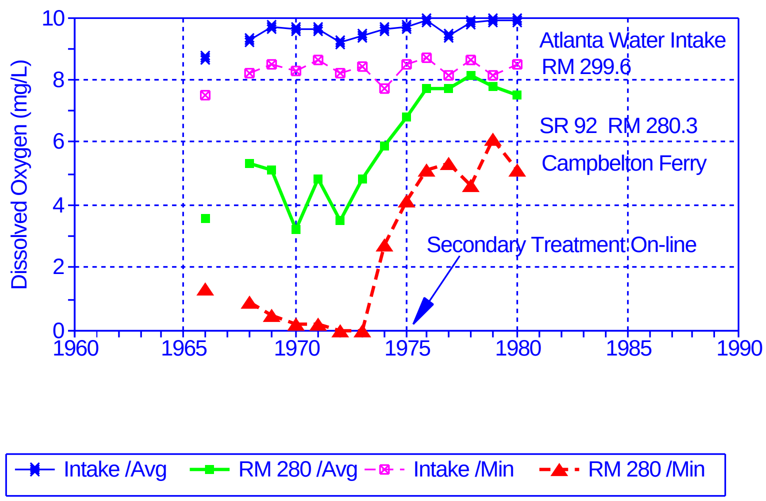



**Figure 10-6**

Long-term trends of DO concentration upstream and downstream of Atlanta wastewater discharges.

*Source: EPD, 1981.*

suspended solids concentrations continued to be high above and below the discharge at Peachtree Creek. Fish kills caused by discharges of raw sanitary sewage and industrial chemicals were commonplace before 1976 (Mauldin and McCollum, 1992).

Rainfall in the area results in overflows from combined sewer systems (CSOs) and large amounts of urban runoff, contributing to large dissolved and suspended constituent loads to the river. Twelve CSOs have been identified in the watershed (Mauldin and McCollum, 1992). Low-flow periods result in less dilution of wastewater, resulting in low DO concentrations, high $BOD_5$, high fecal coliform densities, and other problems.

A severe drought in 1988 caused the DO level to dip below 4 mg/L in the study region from April to August (Mauldin and McCollum, 1992). A major fish kill occurred during October of 1988 due to an unidentified agent (Mauldin and McCollum, 1992). The many impoundments along the river and releases of cooling water from fossil fuel plants, in excess of 1,000 cfs, contribute to water temperature increases, further reducing the waste assimilation capabilities of the river. Atlanta's population is served by 27 water pollution control plants, with designated flows greater than 0.01 mgd, located along the river and its tributaries. The 12 largest water pollution control plants in the Atlanta region have a total design capacity of 404 mgd. The largest facility, the R.M. Clayton plant, is operated by the city of Atlanta and has a capacity of 120 mgd. More than half of the total volume of wastewater enters the river near river mile 301 downstream of the city of Atlanta's water intake (Mauldin and McCollum, 1992).

# Legislative and Regulatory History

Concern for the coordination of water and sewer facility planning and operation has existed in Atlanta since the early 1930s. Construction of the metropolitan sewer system began in 1944 as a cooperative effort between Atlanta local governments. From 1950 to 1952 a major functional consolidation, The Plan of Improvement, was prepared to better define service functions between the city of Atlanta and Fulton County. Atlanta was the primary provider of sewage treatment at that time. During the 1960s the near septic conditions in the river concerned many people. Utility of the waters was greatly reduced, threatening water supplies, recreation, and aquatic habitats. Studies were conducted to identify problems and needs. Technology was available to remedy many of the problems identified, but funding was unavailable.

The Georgia Water Quality Control Act (enacted 1964, amended) was the first major state law to be applied to water quality management. The act gives the Georgia Environmental Protection Division (EPD) power to control all types of pollution in the state's waters from both point and nonpoint sources. In the late 1960s the Atlanta Region Metropolitan Planning Commission (now the Atlanta Regional Commission or ARC) prepared several reports on the consolidation of water and sewer services. The Preliminary Water and Sewer Report, issued in 1968, provided elements of an Administrative Plan for water and sewers in the Atlanta region. The report called for a basinwide water/sewer authority, representing nine counties, to oversee water quality management on a basinwide scale. Unfortunately, local officials did not support the plan because of the large estimated cost (Hammer et al., 1975).

The next state-level move toward regulation was the Metropolitan River Protection Act (MRPA) (enacted 1973, amended), which allows the ARC to advise local governments when proposed developments violate the Chattahoochee Corridor Plan. The plan establishes standards for development based on the carrying capacity of the land within 2,000 feet of impoundments or riverbank of the Chattahoochee or within the 100-year floodplain, whichever is greater (ARC, 1984). The Soil Erosion Act of 1975 also created controls over the effects of development in the area. This act requires local counties and municipalities to adopt and enforce local ordinances to control soil erosion from land-disturbing activities within their jurisdiction.

The 1972 CWA resulted in significant improvement of the water quality in the Upper Chattahoochee River Basin. Funding was provided under the CWA in the form of the Construction Grants Program. The state of Georgia received $117 million in 1976 under this program, but funding decreased steadily. Only $41 million was provided in 1983, despite the fact that Georgia reported needs of $300 million in 1983 (Lawler et al., 1989). Beginning in 1988 funding for the Construction Grants Program was reallocated to the State Revolving Fund (SRF) as a mechanism for providing financial assistance to municipalities. The CWA established secondary treatment as the minimum allowable level for municipal plants. The National Pollutant Discharge Elimination System (NPDES), a national permit program that regulates polluted discharges and requires permittees to monitor effluent quality, is also included in the CWA. States were called upon to develop water quality standards, water use classification, and effluent limits based on water quality criteria established by USEPA.

Attempts were made to improve water quality in the Chattahoochee River by regulating flow. The EPD set requirements for minimum flow of 750 cfs upstream of Atlanta (Cherry et al., 1980). A regulatory dam downstream from Buford Dam has been proposed and modeled. The dam would ensure Atlanta's water supply into the 21st century and aid in regulating river flow. The requirement for minimum releases from Buford Dam would be eliminated. It is not possible to greatly affect flow since there is a limited amount of water available and water supply demands and wastewater flows continue to increase.

# Impact of Wastewater Treatment: Pollutant Loading and Water Quality Trends

Major improvements in water quality occurred in the Chattahoochee Basin during the 1970s and early 1980s, resulting from implementation of secondary treatment. The effects of the increasing load of wastewater were diminished by better treatment technology. Figure 10-7 shows the increasing trends of effluent discharge rates for the area's larger wastewater treatment plants. By 1974 all Atlanta-area waste treatment facilities had been upgraded to provide secondary levels of treatment. Before implementation of secondary treatment, DO levels were severely reduced by wastewater discharges from Atlanta (Figure 10-8). Figures 10-6 and 10-8 show dramatic improvements beginning in 1974. The

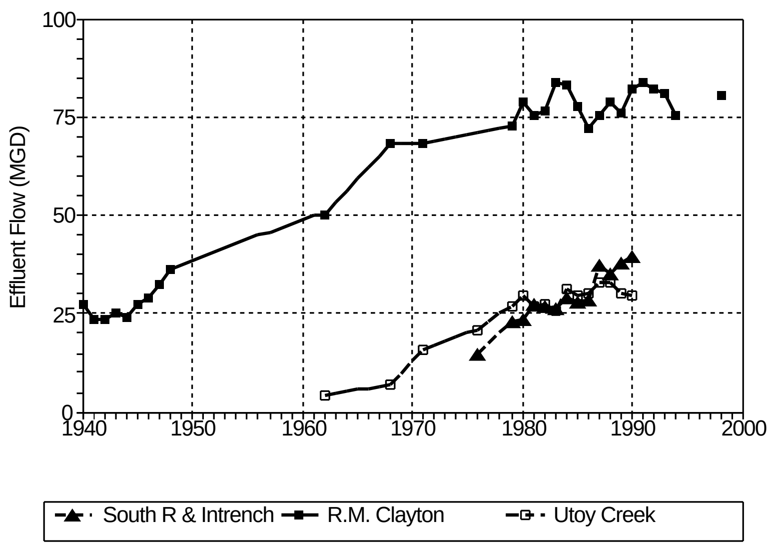



**Figure 10-7**

Long-term trends of wastewater flow for major wastewater treatment plants in the Atlanta area.

*Sources: ARC, 1984; USEPA, 1971; USPHS, 1963; Woodward, 1949; Richards, 1999.*

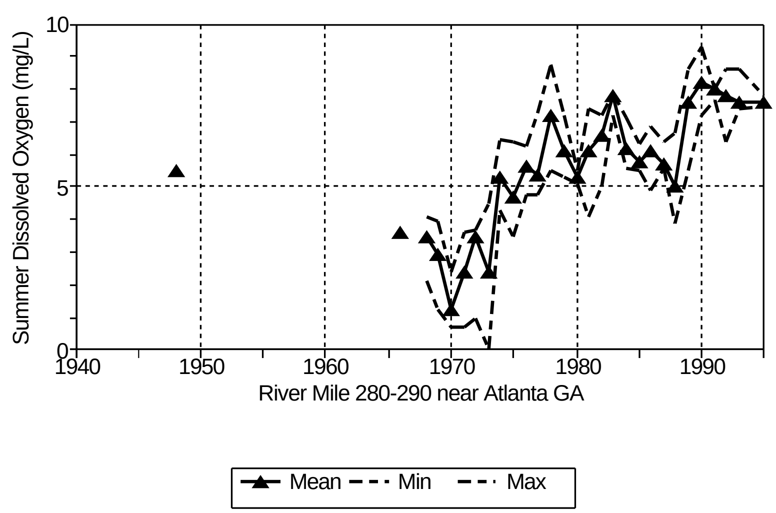



**Figure 10-8**

Long-term trends of mean, minimum, and maximum summer DO in the Chattahoochee River near Atlanta, Georgia (RF1-03130002066) (mile 280-290).

*Source: USEPA (STORET).*

effects of secondary treatment on DO concentrations are particularly notable during the summer months (Figure 10-9). Water quality has improved despite a doubling of Atlanta's population over the period from 1970 to 1996 (Figure 10-5).

Many advances in improving water quality since 1974 can be attributed to continually improving operation and maintenance procedures. Figure 10-10 indicates improvements in suspended solids concentrations and $BOD_5$ in the effluent wastewater from the R.M. Clayton plant, the largest in the Atlanta region. These improvements resulted primarily from improved operator training and upgrading of the solids-handling facility. Similar changes took place at other area plants during this time. The R.M. Clayton plant operated at a primary level of treatment from the late 1930s to the mid-1960s. For much of this time the capacity of the plant exceeded the design flow and treatment was below design level. When the plant was upgraded to provide secondary treatment, around 1968, the design flow was also increased to 120 mgd. A portion of the wastewater flow continued to receive only primary treatment into the early 1970s, when further

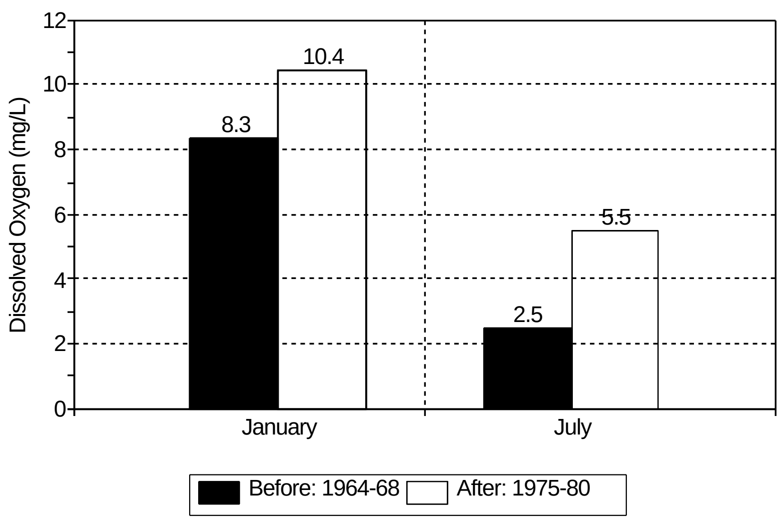



**Figure 10-9**

Comparison of January and July mean dissolved oxygen below Atlanta wastewater discharges before and after upgrade to secondary treatment.

*Source: EPD, 1981.*

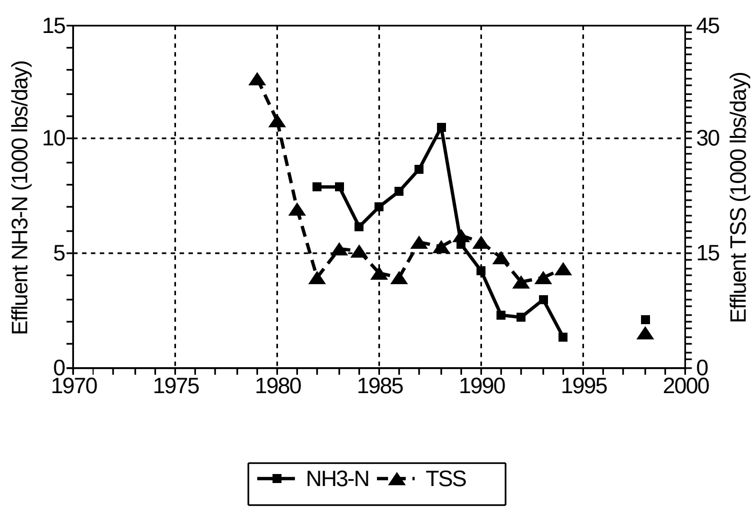



**Figure 10-10**

Performance of the R.M. Clayton wastewater treatment plant.

*Sources: ARC, 1984; USEPA, 1971; USPHS,* improvements were made. In 1974 the R.M. Clayton Plant was providing secondary treatment to 100 percent of the plant's wastewater flow. In the early 1980s operating and maintenance improvements further lowered $BOD_5$ concentration in the effluent wastewater. The R.M. Clayton plant was upgraded to advanced secondary with ammonia removal in 1988. By December 2000, the R.M. Clayton plant, the Utoy plant, and the South River plant will have state-of-the-art effluent filters, biological phosphorus removal, ultraviolet disinfection, and new headworks (Richards, 1999). Decreases in the $BOD_5$ loading of effluent at the R.M. Clayton Plant as a result of upgrading levels of treatment are shown in Figure 10-11.

All of the larger wastewater treatment plants in the Atlanta region must meet treatment requirements more stringent than secondary treatment. Phosphorus removal and restrictions on phosphates in detergents, for example, have resulted in a decline of ambient phosphorus concentrations downstream of Atlanta from approximately 1.0-1.2 mg/L in the early 1980s to approximately 0.1 mg/L a decade later (ARC, 1998). Land application of treated wastewater is also being used at several facilities in the region, with treated wastewater sprayed on forestland, golf courses, or other landscaped areas. At the 4,000-acre E.L. Huie Land Application site, the Clayton Water Authority operates the largest site, treating 18 mgd by reclaiming the treated effluent for its water supply since the water percolates through the soil and back to the raw water source (ARC, 1998).

A combined sewer system, originally constructed in Atlanta ca. 1900-1940, has historically contributed to water pollution in the Chattahoochee River. State legislation adopted in 1990 required the elimination or control of the CSO system. As of 1998, 7 of the 10 CSOs in Atlanta were associated with wastewater treatment plants for solids removal and disinfection. Two sites had been completely eliminated by separation of storm water and sewage collection systems, and additional projects were planned to continue the separation of storm water and sanitary sewage (e.g., Utoy Creek sewage separation project).

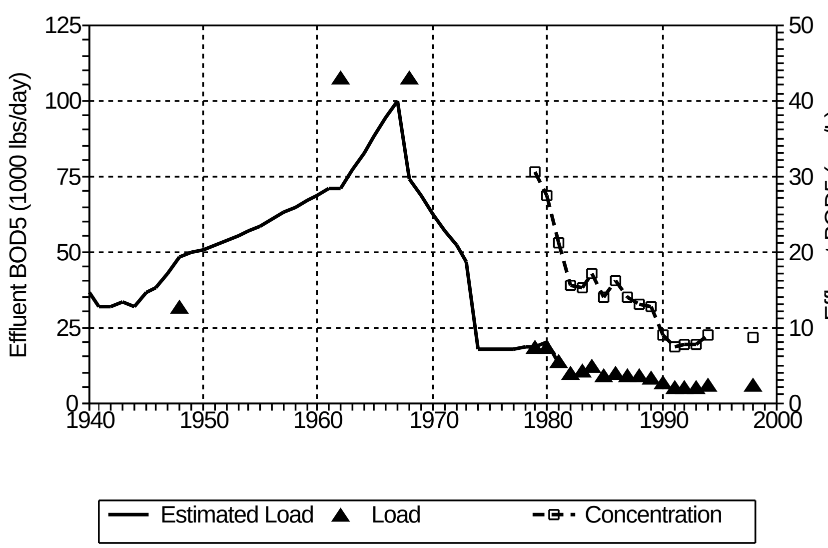



**Figure 10-11**

Long-term trends of effluent $BOD_5$ for the R.M. Clayton wastewater treatment plant. Data for calculated $BOD_5$ based on effluent flow data, 200 mg/L influent $BOD_5$, and removal rates of 35 percent (primary), 85 percent (secondary), and 95 percent (tertiary).

*Sources: ARC, 1984; USEPA, 1971; USPHS, 1963; Woodward, 1949, Richards, 1999.*

# Impact of Wastewater Treatment: Recreational and Living Resources Trends

Historical records of fish population in the Chattahoochee River below Atlanta are very limited. Conditions downstream of Atlanta's wastewater discharge were unsuitable for fish survival during the 1970s, and no fish surveys could be collected (Mauldin and McCollum, 1992). Shelton and Davies (1975) conducted a preimpoundment survey of the area to be flooded by the West Point Dam. The survey lasted from January 1972 to May 1974. The station closest to Atlanta on the Chattahoochee was at Franklin, Georgia. During the early 1970s study period, the Chattahoochee River was described as carrying a high organic load from municipal wastes, a high suspended solids load from agricultural and construction practices, and high chemical concentrations from industrial effluents. The relatively poor water quality in the Chattahoochee River affected the distribution and abundance of fish species sampled in the main stem versus the tributaries. Seventeen species of fish were collected in the Chattahoochee River at Franklin, which is less than half the number of species expected for Georgia rivers of similar size.

A fish survey of the Chattahoochee River conducted between July 1990 and June 1992 revealed the return of fish in great numbers to the portion of the river below the city of Atlanta. The number of species collected ranged from 14 or 15 at the sites in the direct vicinity of the wastewater treatment plant to 18 to 22 at the sampling sites located 63 and 23 km downstream, respectively. The diverse species collected represented a considerable improvement from conditions in the early 1970s, when only 17 species were sampled at Franklin, about 100 km downstream from the wastewater treatment plant, and no fish were present downstream of Atlanta's water supply intake (Mauldin and McCollum, 1992). The recent survey collected 12 gamefish species compared to 8 collected by Shelton and Davies (1975); the most abundant of game species by weight were largemouth bass, bluegill, and channel catfish. Samples were analyzed using the Index of Biotic Integrity (IBI) (Karr, 1981; Karr et al., 1986). IBI scores for the four sampling sites (located 1 km upstream of the discharge, 1 km downstream of the discharge, 23 km downstream, and 63 km downstream) ranged from 22 to 32, which is 37 percent to 53 percent of the maximum score of 60. Scores in the 21 to 30 range indicated poor stream quality for fish and a population dominated by omnivorous, pollutant-tolerant forms. The Chattahoochee River below Atlanta's wastewater treatment plant discharge had a disproportionate segment of carp (75 percent), a higher proportion of bluegill to redbreast sunfish than is common in Georgia streams, and fewer gamefish than expected. A score of 32 measured 23 km downstream from the discharge indicated fair stream quality for fish. Overall, the fish sampled appeared to be healthy. Neoplasms were not observed in bluegill specimens, nor were gross external abnormalities observed in catfish.

The results of the 1990 to 1992 sampling show that water quality has improved immensely since 1972 when the river below Atlanta was described as "in near septic condition for a reach of 35 miles" (GADNR, 1991). The improve-

**Table 10-3**. Fish kills due to municipal waste discharges in the greater Atlanta region. *Source: Mauldin and McCollum, 1992.*

| Location | Date of occurrence | Duration | Severity | Length of Stream Affected *(miles)* | Game Species *(%)* |
|---|---|---|---|---|---|
| Chattahoochee River, Atlanta | 8/13/64 | 1 day | Moderate | 6 | 70 |
| Proctor Creek, Atlanta | 7/18/76 | 1 day | Moderate | 5 | 3 |
| Chattahoochee River, Atlanta | 7/29/76 | 12 hours | Moderate | 15 | 75 |
| Nancy Creek, Chamblee | 7/24/81 | 12 hours | Severe | 3 | 87 |
| Marsh Creek, Sandy Springs | 9/3/81 | 1 day | Moderate | 1 | 37 |
| Little Nancy Creek, Atlanta | 9/28/84 | Unknown | Moderate | 1 | 63 |

ment is due to enhanced wastewater treatment (Mauldin and McCollum, 1992). Combined efforts of the state, communities, and industries and USEPA grants for municipal wastewater treatment systems have put the Upper Chattahoochee River on the road to recovery. Fish kills have not been commonplace since 1976, except for one caused by an unidentified agent in 1988 (Mauldin and McCollum, 1992) (Table 10-3). Bloodworm-infested sludge beds no longer float in the shallows below Atlanta, sportfish populations are recovering, there is more DO in the water, macroinvertebrate fauna is more diverse, and fecal coliform bacteria levels dropped 82 percent in only 4 years (USEPA, 1980). The number of water quality violations has dropped dramatically since the 1970s even though standards have increased. Water-based and contact recreation are now fully supported along the Chattahoochee River reach from Buford Dam to Peachtree Creek. Fishing is generally supported along the entire river (GADNR, 1991). As a result of the investments to upgrade water pollution control facilities in the Atlanta metropolitan region, the natural ecological balance of the river is beginning to be restored.

# Summary and Conclusions

Results of legislation and regulations have been positive due to active enforcement on all levels. Water quality monitoring by the EPD and under the NPDES program helps to evaluate progress and indicate violations. Water quality in the Upper Chattahoochee River, particularly in the vicinity of Atlanta, has improved dramatically with implementation of secondary waste treatment. Chemical, physical, and biological data all indicate a great improvement in water quality when compared to data from investigations done in the 1940s, 1950s, 1960s, and 1970s (Lawler, Matusky, and Skelly Engineers, 1989). Although total loading of pollutants to the Chattahoochee River, such as $BOD_5$, suspended solids, and phosphorus, have been reduced significantly as a result of major capital improvements to the wastewater and water pollution control infrastructure of the Atlanta region during the 1970s and 1980s, the dramatic improvements in water quality of the river tended to level out during the 1990s. Contemporary degradation of water quality is attributed to rapid urban development, the expanding area of the outer suburbs of Atlanta, and nonpoint source loading from stormwater runoff. The Georgia DNR listed more than 600 stream miles in the Atlanta area as impaired in the 1994-1995 305(b) report, with less than 20 percent of the degradation in stream miles attributed to point source pollution. As a result of increased sediment loading from watershed runoff to the Chattahoochee River and the reservoirs, water supply intakes are routinely shut down during and after rainstorms. Contemporary water resource issues for Atlanta include the degradation of water quality in rivers and streams, the adverse impact of storm water runoff on public water supplies and recreational lakes, and probable limits on future water supply allocations under the tristate river compacts that have sparked “water wars” between Georgia, Alabama, and Florida (Kundell and DeMeo, 1999). Despite the successes of past water pollution control efforts during the 1970s and 1980s, the Atlanta region is now confronted with serious water supply and water quality issues that will affect the future economic viability of the Atlanta metropolitan region. To achieve the solutions to contemporary water quality problems required by state and federal agencies, regional cooperation is needed for watershed management (Kundell and Demeo, 1999).

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